

Physical and chemical parameters influencing biological recovery downstream of steel slag leach beds in the East Branch of Raccoon Creek

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The East Branch of Raccoon Creek was the highest contributor of acidity to the Raccoon Creek mainstem prior to reclamation projects. The 51.6 km² subwatershed, which is highly impacted by prereregulation coal mining, contains 10 steel slag leach beds that passively treat low pH, Fe and Al-rich waters. While acidity and metal load reductions show improved water quality, these factors do not account for biological recovery or localized stream conditions that influence sediment deposition and sediment and aqueous metal concentrations. In this study, water chemistry, sediment chemistry, aquatic macroinvertebrate richness and diversity, habitat quality, and stream gradient are examined. Macroinvertebrate richness and diversity (Macroinvertebrate Aggregated Index for Streams), and habitat quality (Qualitative Habitat Evaluation Index), are evaluated at 5 sites downstream of treatment systems. Preliminary investigations show that macroinvertebrate richness and diversity ranges from good to very poor and may be related to habitat quality or proximity to treatment systems. Variations in macroinvertebrate score may suggest zones of recovery and impairment on the mainstem. Water quality and gradient are examined at 18 sites, 5 of which are macroinvertebrate bioassay sites. Water quality samples from mainstem sites and treatment tributaries are being taken 4 times over two years in order to examine water column chemistry in both low-flow and high-flow regimes. Models of alkalinity and acidity sources by river mile are used to determine how the steel slag bed treatment systems increase the buffering capacity of the stream. Stream gradient (the elevation between the thalwegs at riffle sites) is measured using a surveyor's level. Based on preliminary results, it appears that macroinvertebrate richness and diversity is influenced by aqueous chemistry, sediment depositions and quality, and habitat quality in a stream undergoing treatment by steel slag leach beds.